PROPOSED APPROACH FOR MASS LOADING CALCULATIONS

Both river flow and constituent data are needed to calculate mass loads of a constituent at a river station. While there are daily mean river flow data for the Delta from the DWR DAYFLO database, water quality data at best are available on a semi-monthly basis.

To complete monthly mass loading estimates for months where no constituent data are available, we must consider possible methods of interpolation and extrapolation. Some of these methods are discussed for obtaining suggestions.

Water quality constituents measured at the river channel stations in the CUWA Study database appear to behave in two ways. There are constituents such as TDS or EC that vary greatly (i.e., their concentrations extend over a large range) with river flow. The other constituents appear either weakly associated with river flow or not at all (e.g., some trace elements). The relationship of constituents to flow can be used to interpolate or extrapolate constituent data. Information regarding seasonal localized upstream activities such as rice drainage releases above the City of Sacramento can explain some of the data scatter or poor flow to constituent observations.

1. Determining Flow to Constituent Relationships

Flow vs. constituent scatter plots and regression curves would be made to determine such correlations. Since these relationships will be unique for different regions in the Delta, the analysis will be made for each benchmark station. Estimates of the constituent values (e.g., concentrations) for unsampled periods would be based on the resulting flow vs. constituent relationships since flow data are available. Example plots of some water quality parameters at Greenes Landing on the Sacramento River are provided (Figure Set 10).

2. Determining Seasonal Constituent Relationships

For constituents that appear to have a poor correlation to river flow (note: determination based on the flow vs. constituent plots), we have several choices. One is to use a computer software interpolation algorithm based on a cubic piece-wise polynomial approximation with continuous first and second derivatives at each knot. The program allows us to interpolate a specified number of uniformly spaced points over a given interval. When an interpolation is performed, the domain of the data is subdivided into evenly spaced increments corresponding to the number of interpolants, and an interpolant is calculated at each increment.

Another approach is to statistically compare the values of a constituent at each calendar month at a given station (Figure Set 11). For example, if DOC data at Greenes

Landing is missing for March 1989, DOC for the month of March of other sampled years at Greenes Landing would be compared to provide an estimated value. The water year type would be considered in selecting a representative value.

3. Monthly Sampling Data vs. Daily Flow Data

A question that always arises in doing mass loading calculations is "How well does an instantaneous grab sample represent the mean daily level or the time period (e.g., month) in which the mass loadings will be calculated?" For those constituents with strong flow and constituent relationships, we might examine mean daily flows of each calendar month to compute estimated constituent concentrations for each day. In the case of those constituents that appear independent of flow, we might base daily estimates on the expected seasonal ranges. This subject is open for major discussion and suggestions.
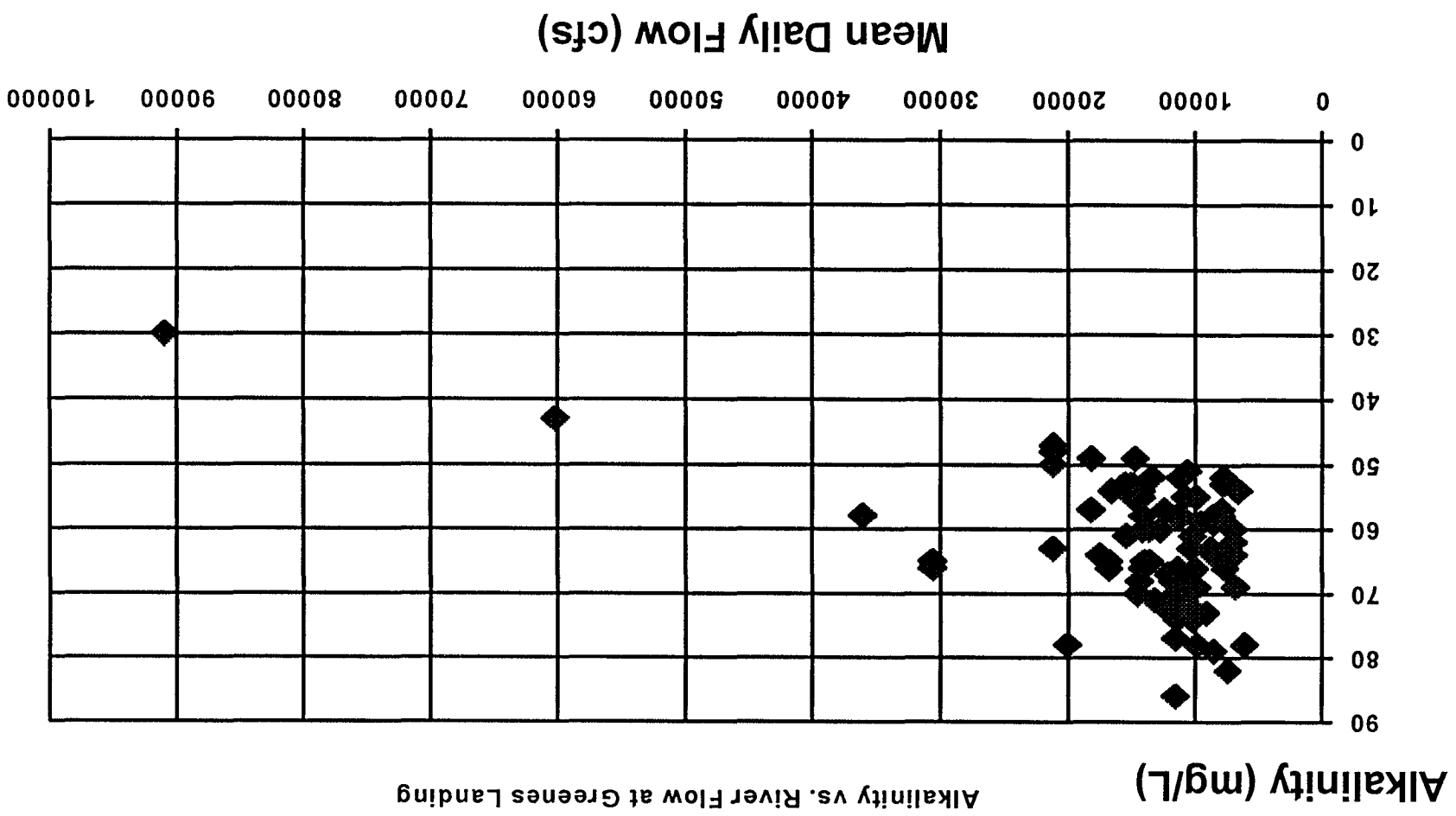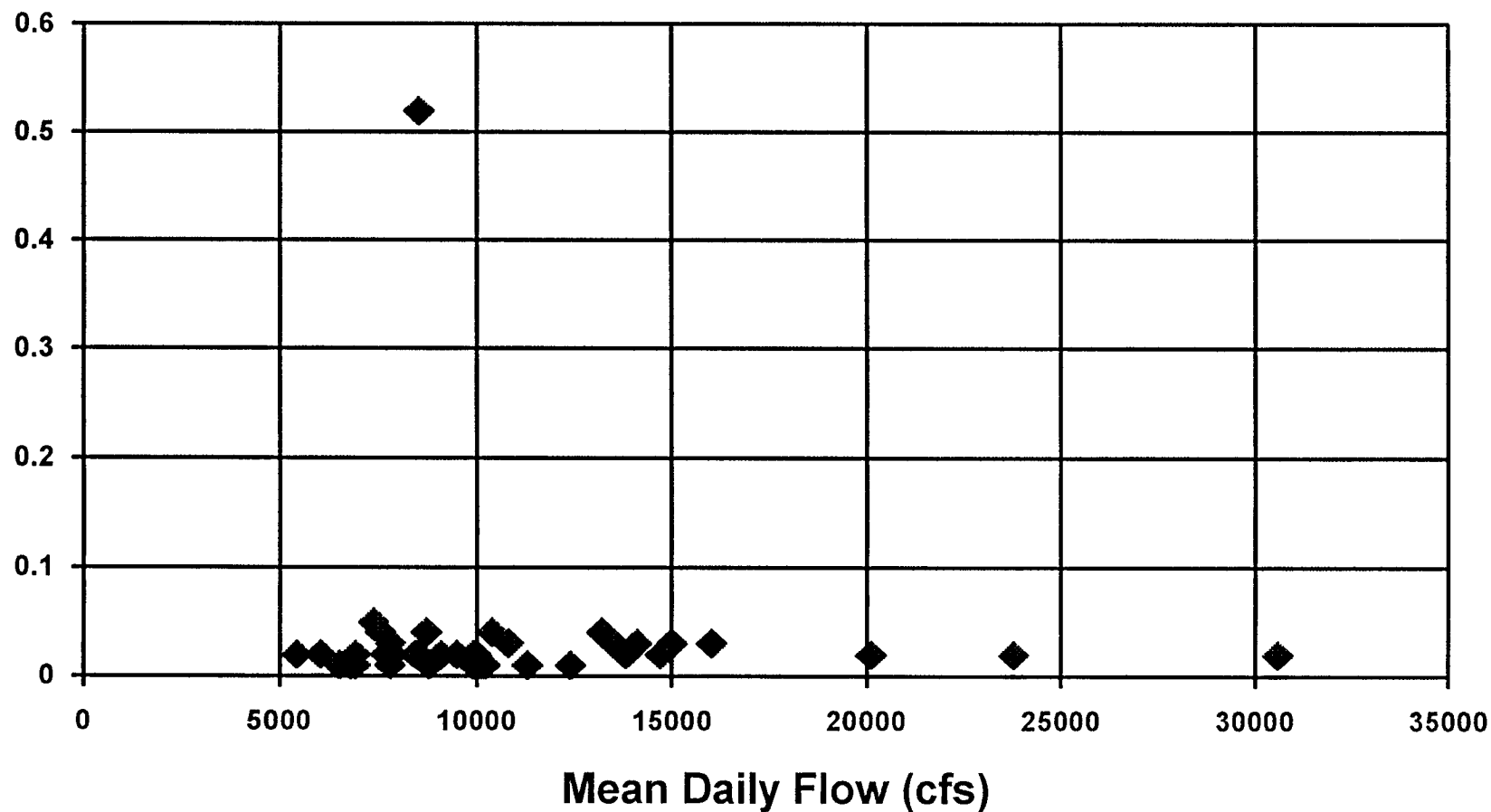
01/10/94

2

Figure 10B

Bromide (mg/L)   Bromide vs. River Flow at Greenes Landing

Mean Daily Flow (cfs)

Figure 10C

EC vs. River Flow at Greenes Landing

EC (microS/cm)

Mean Daily Flow (cfs)

Figure 10D

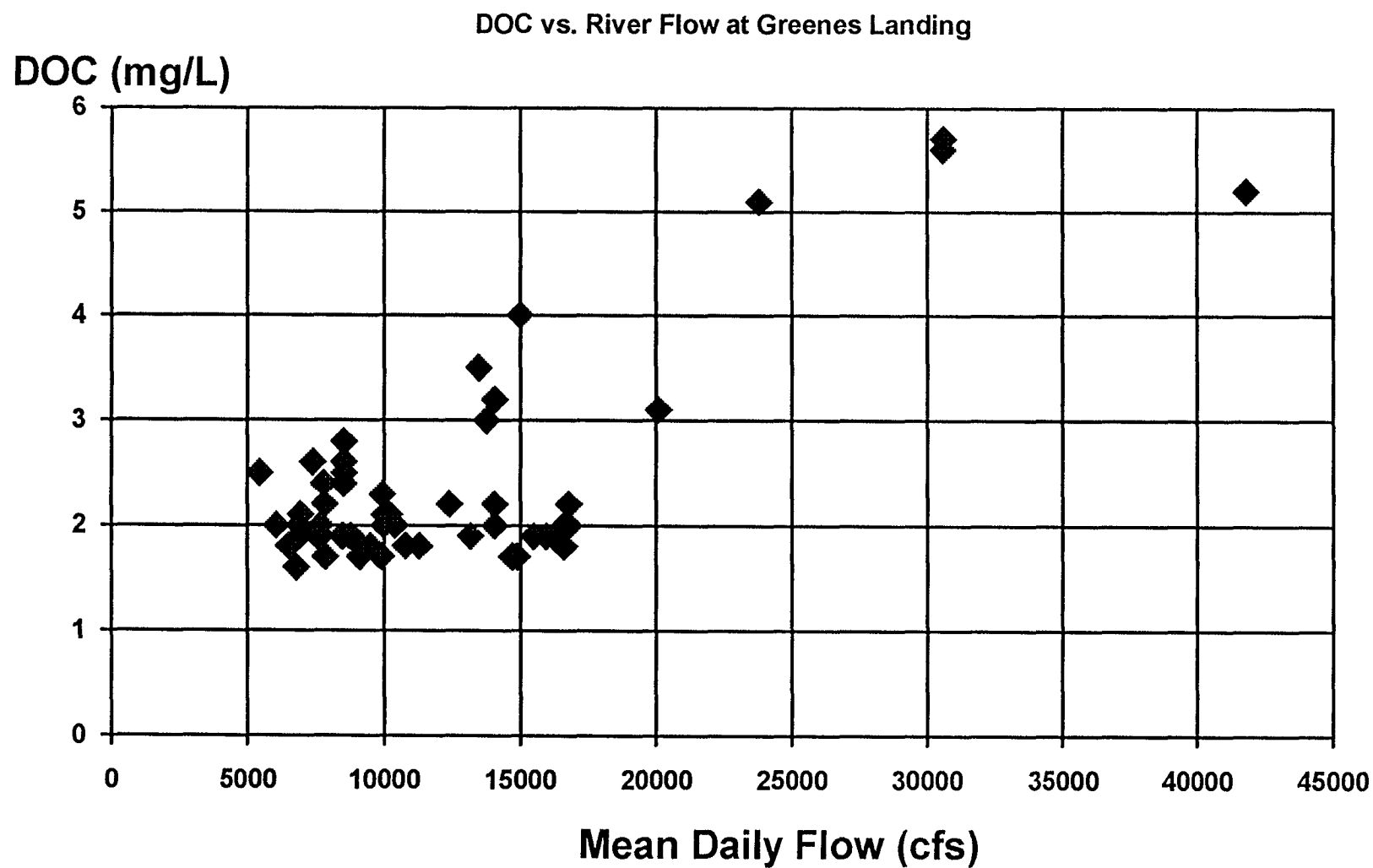DOC vs. River Flow at Greenes Landing

Figure 10E

TFPC vs. River Flow at Greenes Landing
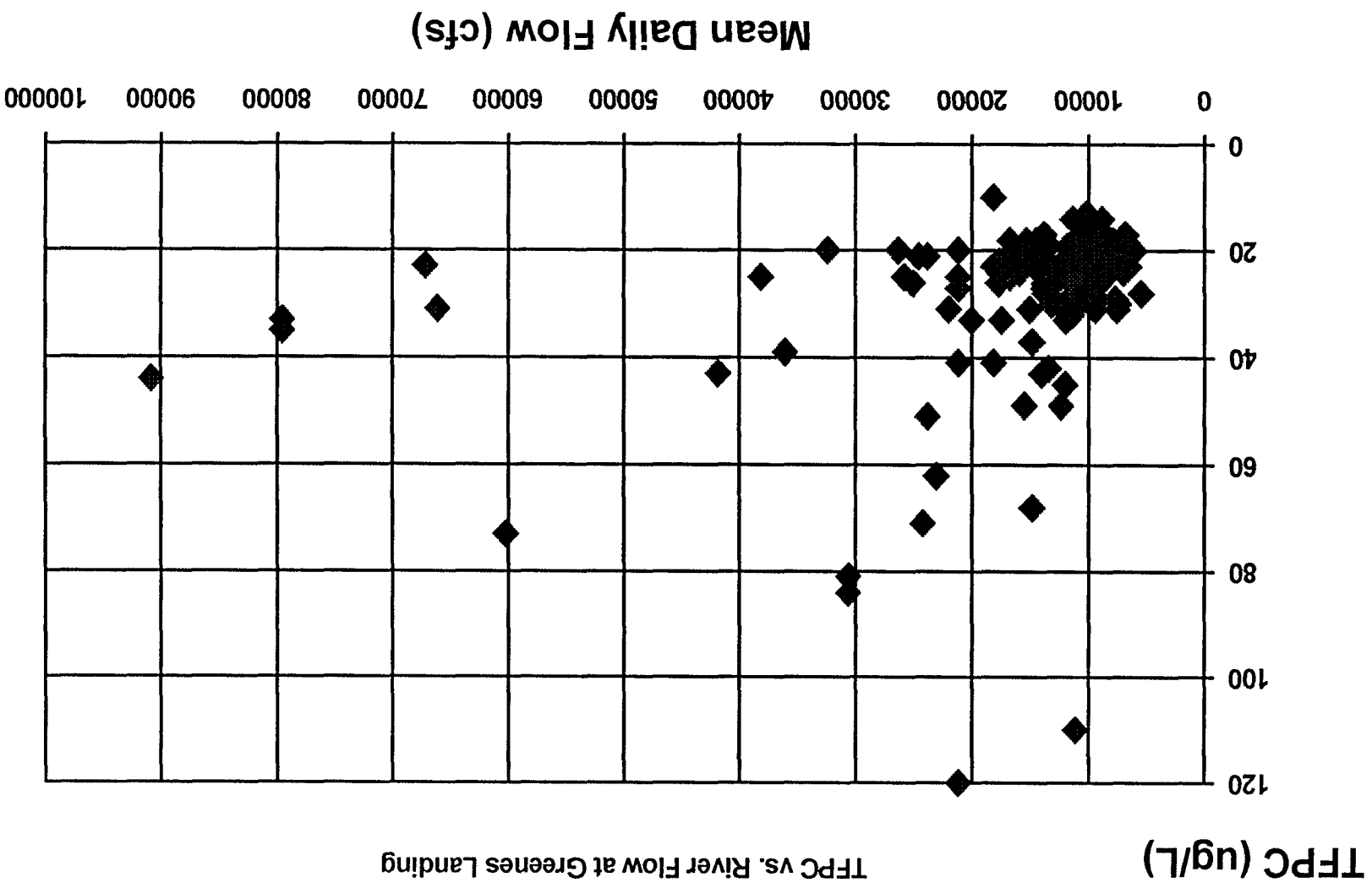
Figure 10F

Turbidity vs. River Flow at Greenes Landing

Figure 11A

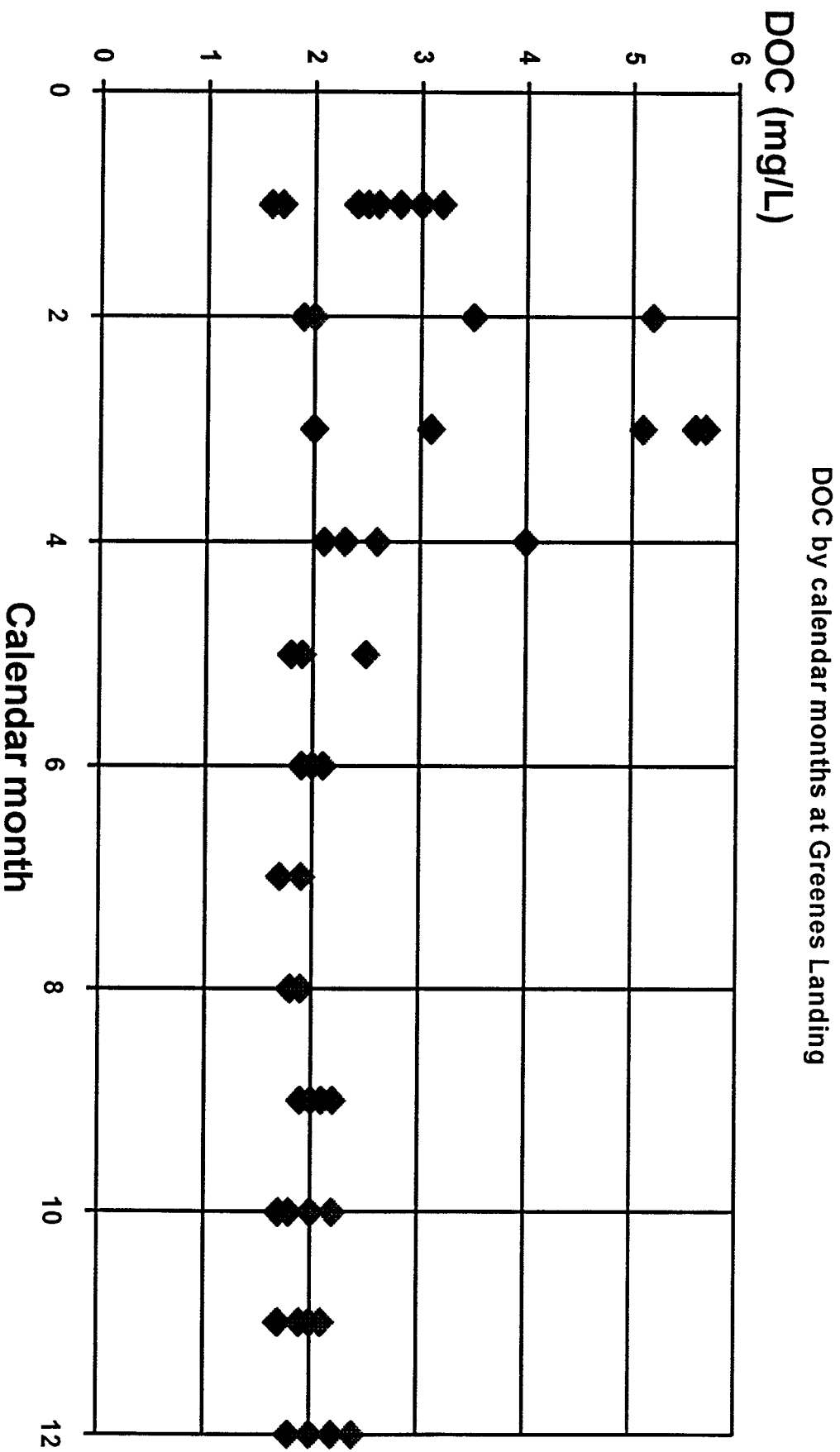DOC by calendar months at Greenes Landing

Figure 11B

TFPC by calendar months at Greenes Landing